CLAIMS

1. An improved filter system including a low pass filter having a response which rolls off towards a crossover frequency and a high pass filter having a complementary response which rolls off towards said crossover frequency such that the combined response of said filters is substantially constant in amplitude at least in the region of said crossover frequency, wherein said response of said low pass filter is defined by a low pass complex transfer function having a first numerator and a first denominator and said response of said high pass filter is defined by a high pass complex transfer function having a second numerator and a second denominator and wherein said second denominator is substantially the same as said first denominator and the sum of said first and second numerators has substantially the same squared modulus as said first or second denominator.

2. An improved filter system according to claim 1 wherein said low pass filter includes a first null response at a frequency adjacent and above said crossover frequency to provide initial rapid attenuation and said high pass filter includes a second null response at a frequency adjacent and below said crossover frequency.

3. An improved filter system according to claim 2 wherein said first null response is provided by at least one complex conjugate pair of transmission zeros such that their imaginary parts lie in the stop band of said low pass transfer function within the crossover region and said second null response is provided by at least one complex conjugate pair of transmission zeros such that their imaginary parts lie in the stop band of said high pass transfer function within the crossover region.

4. An improved filter system according to claim 1 when used as a crossover filter for signals in an electrical domain.

5. A loudspeaker system including an improved filter system according to claim 4.

6. An improved filter system according to claim 1 when used as a crossover filter in an electromagnetic domain.

7. An improved filter system according to claim 1 when used as a crossover filter in an optical domain.

8. An improved filter system according to claim 1 when used as a crossover filter in an acoustical domain.

9. An improved filter system according to claim 1 when used as a crossover filter in a mechanical domain.

10. An improved filter system according to claim 1 when used as a crossover filter in two more domains simultaneously.

11. An improved filter system according to claim 10 wherein said domains include electrical and acoustical domains.

12. An improved filter system according to claim 10 wherein said domains include mechanical and acoustical domains.

13. An improved filter system according to claim 10 when said domains include electrical and optical domains.

14. An improved filter system according to claim 10 when said domains include electrical, mechanical and acoustical domains.

15. An improved filter system according to claim 1 wherein said low and high pass filters include passive filters.

16. An improved filter system according to claim 1 wherein said low and high pass filters include active filters.

17. An improved filter system according to claim 1 wherein said low and high pass filters include analog filters.

18. An improved filter system according to claim 1 wherein said low and high pass filters include digitally implemented filters.

19. A method of tuning a filter system including a low pass filter having a response which rolls off towards a crossover frequency and a high pass filter having a complementary response which rolls off towards said crossover frequency such that the combined amplitude response of said filters is substantially constant at least in the region of said crossover frequency, said method including the steps of:

selecting a filter topology capable of realizing a low pass complex transfer function defined by a first numerator and a first denominator;

selecting a filter topology capable of realizing a high pass complex transfer function defined by a second numerator and a second denominator;

setting the second denominator so that it is substantially the same as the first denominator; and

setting the squared modulus of the sum of the first and second numerators so that it is substantially the same as the squared modulus of the first or second denominator.

20. A method according to claim 19 including the step of determining coefficients for said transfer functions and converting said coefficients to values of components in said filter topologies.

21. A method according to claim 19 wherein said low pass transfer function includes at least one complex conjugate pair of transmission zeros such that their imaginary parts lie in the stop band of said low pass transfer function within the crossover region to provide a null response at a frequency adjacent and above said crossover frequency and said high pass transfer function includes at least one complex transmission zero such that their imaginary parts lie in the stop band of said high pass transfer function within the crossover region to

provide a null response at a frequency adjacent and below said crossover frequency.

22. A method according to claim 19 wherein said filter system is used as a crossover filter for signals in an electrical domain.

23. A method according to claim 19 wherein said filter system is used as a crossover filter in an electromagnetic domain.

24. A method according to claim 19 wherein said filter system is used as a crossover filter in an optical domain.

25. A method according to claim 19 wherein said filter system is used as a crossover filter in an acoustical domain.

26. A method according to claim 19 wherein said filter system is used as a crossover filter in a mechanical domain.

27. A method according to claim 19 wherein said filter system is used as a crossover filter in two more domains simultaneously.

28. A method according to claim 19 wherein said domains include electrical and acoustical domains.

29. A method according to claim 19 wherein said domains include mechanical and acoustical domains.

30. A method according to claim 19 wherein said domains include electrical and optical domains.

31. A method according to claim 19 wherein said domains include electrical, mechanical and acoustical domains.

32. A method according to claim 19 wherein said low and high pass filter include passive filters.

33. A method according to claim 19 wherein said low and high pass filters include active filters.

34. A method according to claim 19 wherein said low and high pass filters include analog filters.

35. A method according to claim 19 wherein said low and high pass filters include digitally implemented filters.

36. An improved filter system substantially as herein described with reference to the accompanying drawings or examples.

37. A method of tuning a filter system substantially as herein described with reference to the accompanying drawings or examples.